CENTRAL INTELLIGENCE AGENCY

CLASSIFICATION SECRET

50X1-HUM

SECURITY INFORMATION

INFORMATION REPORT

REPORT

CD NO.

COUNTRY USSR

DATE DISTR. 17 July 1952

SUBJECT Design and Production of Turbine Blades at Zavod 2, Kuybyshev (Upravlencheskiy)

NO. OF PAGES 9

DATE OF INFO.

NO. OF ENCLS. (LISTED BELOW) 1 (4 pages)

50X1-HUM

PLACE ACQUIRED

SUPPLE REPORT

THIS IS UNEVALUATED INFORMATION

50X1-HUM

CLASSIFICATION SECRET

STATE	X	NAVY	X	NSRB		DISTRIBUTION									
ARMY	X	AIR	X	FBI											

[redacted] 50X1-HUM

III. APPENDICES

[redacted] 50X1-HUM

Appendix F

Air [redacted] 50X1-HUM

Appendix G

Scientific Order of Battle - (a) Establishments - Nil.
(b) Personalities - see separate sheets attached

Appendix H

Miscellaneous (to include MPD activities, etc.) No information

IV. ANNEXURES

Annexure A - Figures 1, 2, 3, and 4.

AIR

Activities of Zavod 2, Kuybyshev

1. [redacted] information on the activities of Zavod 2, Kuybyshev from October 1946 to December 1951:[1] 50X1-HUM

a) [redacted] it was common knowledge that a parallel factory in Leningrad known as "Versuchs Werk No. 1" was producing engines similar in design to those being produced at Zavod 2. In fact, another name for Zavod 2 was "Versuchs Werk No. 2". 50X1-HUM

b) The 022 type engine passed the official state test run at Zavod 2 toward the end of 1950.

c) The specific fuel consumption of the 022 engine was improved from 300 grams/BHP/hr to 250 grams/BHP/hr (0.614 lbs to 0.512lbs).

d) Although the 022 produced at Kuybyshev was still in the factory [redacted] 50X1-HUM
[redacted] a 4-engined aircraft 50X1-HUM
(type unknown) carrying 022 engines had carried out engine test flights. The airfield was not known.

e) [redacted] 50X1-HUM
[redacted] the compressor had 16 stages and the turbine 8.

2. [redacted] 50X1-HUM

Until the dwellings were ready for the deportees, they were housed in the sanatorium at Upravlencheskiy. After their arrival at the factory, their first task was to unpack the equipment brought from Germany. Such equipment included all machines and tools normally found in a large engineering works, e.g. millers, lathes, drilling machines, grinders, etc., and included a copying lathe and three copying millers for blade manufacture.

3. General Details [redacted] 50X1-HUM

1947 - The manufacture of patterns, jigs, and gauges for the 003 type engine. The jigs and patterns [redacted] were used on 50X1-HUM operations involving the following:

welding
milling
drilling
turning
measuring

and were confined to blade manufacture.

1948 - As above, but for the 012 type engine.

1949 [redacted] turbine rotor disc for the gas turbine type starter. German [redacted] Russian [redacted] 50X1-HUM
(This starter was first tried unsuccessfully on the 012 engine, but was later successful on the 022 type engine.

[redacted] 50X1-HUM

4. The first productive task allotted to the Germans at Kuybyshev was to test the 003 engine. This engine had been completely developed in Germany, but nevertheless they were obliged to install the test beds and re-test the engine. Although all the jigs and assemblies necessary for the production and test of the 003 engine had been brought from Germany, they were ordered to make a new set. [redacted] 50X1-HUM

5. The higher level German personnel were split into two distinct groups, the BMW and Junkers groups. At lower levels personnel were integrated.

6. The BMW group had to develop the 003 engine, and the Junkers group the 012.

7. The 003 Engine

In early 1947 the official works test run on this engine was carried out, and in July/August 1947 the Russian state test run commission arrived and carried out the official state test run. They were satisfied with the test, and the engine was sent away to an unknown destination. The Russians paid a premium of 1,000,000 rubles for this achievement. This sum it is believed was given to Herr Prestel and Dr. Scheibe. [redacted] 50X1-HUM

8. The 012 Engine

This engine was in a partially developed state when it left Dessau, and at Kuybyshev responsibility for development was vested in the Junkers personnel. The development went ahead very smoothly, and people felt "in their bones" that no troubles would interfere with the development program. The Russians evidently shared this view since, after the successful works run, the Russians sent the engine away to an unknown destination in the middle summer of 1948 for the official state test run. In this manner they avoided paying any premiums.

9. The 022 Engine - General

It was common knowledge that the design of the engine had been commenced in Germany but that the design had only reached a preliminary stage. In the USSR the Junkers group were given the development responsibility.

10. This engine was a turbo-prop model, fitted with two counter rotating propellers.

11. [redacted] 50X1-HUM

12.

13. [redacted]. The engine [redacted] had a 14-stage compressor and a 3-stage turbine.

14. At first the engine was unsatisfactory because of high fuel consumption 300 grams/BHP/hr, but was later improved to 250 grams/BHP/hr [redacted] the figures 300 and 250 grams followed by some other units were referred to frequently [redacted] PS/Stunde [redacted] were the other units mentioned.) 50X1-HUM 50X1-HUM

15. [redacted]

16. Toward the end of 1950 and after the works test run, the Russian state test run commission arrived and carried out the official State Test Run.

17. Early in 1951 a Russian director from a parallel factory in Leningrad, "Versuchs Werk No. 1" visited Kuybyshev and told chief of factory that personnel at "Versuchs Werk No. 1" were amazed that Kuybyshev personnel had achieved so great an improvement in the fuel consumption. [redacted] 50X1-HUM
[redacted] the factory at Leningrad was producing aircraft engines, and 50X1-HUM
that this information was common knowledge at Kuybyshev. In fact another name for Kuybyshev was "Versuchs Werk No. 2".

18. [redacted] a 50X1-HUM
4-engined aircraft equipped with four 022 engines had carried out engine flight tests. These engines were not made in, and did not come from, Kuybyshev.

19. [redacted] 50X1-HUM

20. After the flight tests, orders were received to develop the 022 further. The necessity for improving the performance was stressed. [redacted] 50X1-HUM

21. [redacted]

22. A total of nine 022 engines of the original type were produced [redacted] 50X1-HUM
[redacted] only three or four complete units were ever 50X1-HUM
available at any period, since shortages and breakdowns made a certain amount of 'cannibalization' inevitable.

23. [redacted] 50X1-HUM
[redacted] there were about
three or four complete 022 engines in Kuybyshev of the old type, and various sub-assemblies of later models.

24. [redacted] the various types of 022 were 50X1-HUM
designated as follows:

Approx. Date	Type	Remarks
Early 1950	022	Seen for first time.
At least by May 1951	022	250 grams/BHP/hr: State Test; Air Test; 14-Stage Compressor; 3-Stage Turbine.
After May 1951	022/5 022/6 022/7	Unknown
Not seen in completed form by 14/12/1951	022/8	16-Stage Compressor - 4-Stage Turbine

25. The 022 Engine - Details of Turbine Rotor Blades

The rotor blades were drop forged in one operation, and were then finished to a size by means of either a copying lathe or a miller. The original copy patterns for the four stages of the turbine blades were made by hand [redacted] dimensions which were as follows: 50X1-HUM

1st stage - 90 mm
2nd stage - 110 mm (Fig. 1)
3rd stage - 150 mm
4th stage - 170 mm

26. The die used in the above forging operations had the following approximate dimensions: base 600 mm, height 500 mm.

27. [redacted] manufacture the copy pattern of the turbine blade by hand to a tolerance of ± 0.03 mm (1.2"). 50X1-HUM
(1000) 50X1-HUM

28. [redacted] there were about 72 blades on each rotor, [redacted] 50X1-HUM the total diameter measured from blade tip to blade tip was between 80-90 cm.

29. [redacted] magazine was available at Kuybyshev, 50X1-HUM containing details of a wax process for producing turbine blades. Experiments using the following process were carried out with great interest at Kuybyshev:

The "wax" blade is cast in a metal mold. Subsequently it is impressed in the molding sand, the wax is melted out, and the blade is finally cast in metal in the mold formed by the sand.

30. The 022 Engine - Details of Turbine Stator Blades

The first two stages were cast, and the other stages were pressure forged using the die and punch shown in fig. 2. (Fig. 3 shows cast blade.)

31. Two dies having different dimensions were used for the pressure forging operation: a rough die, and a precision die. [redacted] 50X1-HUM

32. The blades were then electrically welded into the stator rings.

33. [redacted] 50X1-HUM The rings were made of sheet metal and [redacted] were 1-2 mm thick.

34. Materials Used

The turbine rotor blades were made of Nimonic, and the stator blade ring metal was stamped E.A.l.T.

35. [redacted] 50X1-HUM

36. Machine/Hr. Details

In Kuybyshev there were three copying millers and one copying lathe. Each copying miller could make six blades in one or two hours. These were standard German machines and were brought over from Dessau. The name on the copying lathe was Heiligenstedt. The hydraulic presses however were not brought from Dessau or Halle. [redacted] 50X1-HUM

37. [redacted] 50X1-HUM

38. State Test Runs

All Germans were forbidden to enter the test house during the run. A special commission arrived from Moscow and carried out the test runs.

[redacted] 50X1-HUM

39. The engines were subjected to a total of 200 hours running time. The engines were run for 5 hours and rested for 2 hours, until a total of 200 hours running was attained.

40. After the test runs, a detailed strip examination was made.

41. Personnel Remaining in Kuybyshev

[redacted] December 1951, there were 250 German men in Kuybyshev. 50X1-HUM

42. [redacted] 50X1-HUM

43. [redacted] Possibility of Personnel Movement between East Zone and Berlin

[redacted] 50X1-HUM

A person requiring to travel from the East Zone to Berlin by train must produce his pass (Ausweis) at the appropriate railway station. Before a ticket is issued, the Ticket Seller writes the number printed on the Ausweis on the ticket. The ticket collector in Berlin collects the tickets but does not inspect the Ausweis.

PERSONALITIES

SCIENTIFIC ORDER OF BATTLE

ZAVOD 2, KUYBYSHEV, AND AIR MINISTRY, MOSCOW

Air Ministry - Moscow

General Lukin

A visit was paid to Zavod 2, Kuybyshev, by General Lukin, who [redacted] 50X1-HUM
[redacted] was from the Luftfahrtministerium (Air Ministry), Moscow. 50X1-HUM

Zavod 2, Kuybyshev

Col. Olekhnovich

Former Russian chief of Zavod, [redacted] was dismissed because he treated the Germans badly. 50X1-HUM

Col. Kuznetsov

The replacement for Olekhnovich.

1. [redacted] Comment: [redacted] 50X1-HUM
[redacted] Test Plant No. 2 in Upravlencheskiy, installed in the buildings of the former aircraft accessory plant No. 145.

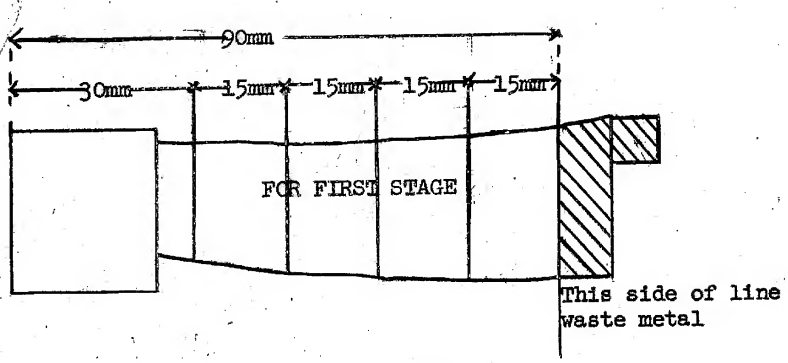
Fig. 1 - Sketch of patterns [redacted] of turbine blades of 022 type engine. 50X1-HUM

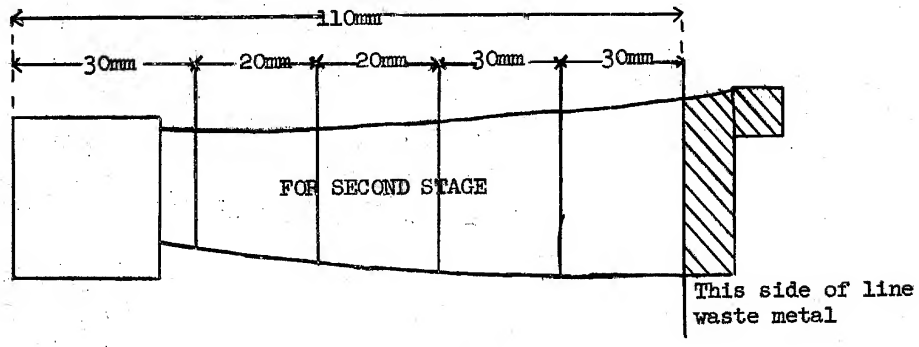
Fig. 2 - Sketch of dies used to manufacture stator blades for 022 turbine.

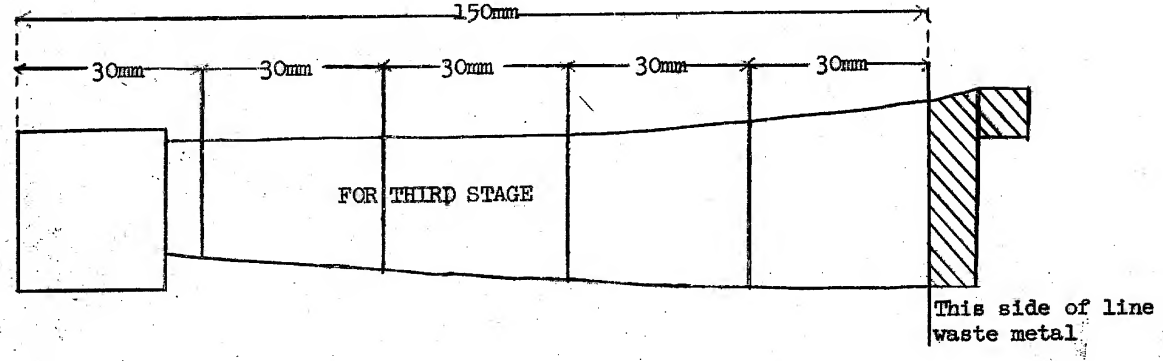
Fig. 3 - Sketch of stator blade used in 022 turbine.

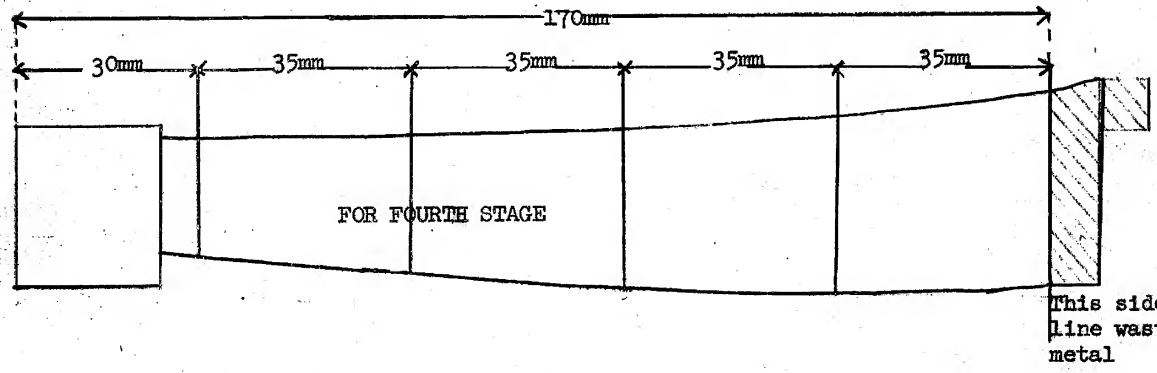
Fig. 4 - View of blade in stator blade holding ring.

Fig. 1



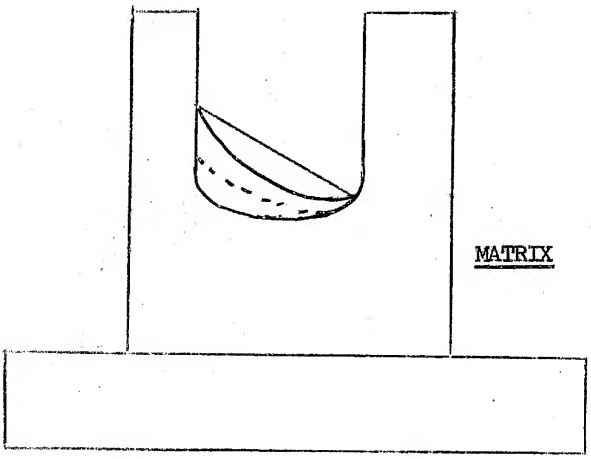






[redacted] sketch of the pattern [redacted] for the rotor blades 50X1-HUM
of the 022 turbine. (All dimensions not shown were forgotten; blade twist angles 50X1-HUM
unknown.) Time to make by hand - 6 hours per pattern. Tolerances = 0.03 millimeters
(0.0012 inches approximately).

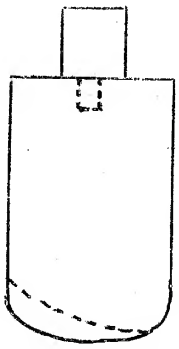
Fig. 2



Note

For each type of stator blade two dies were used:

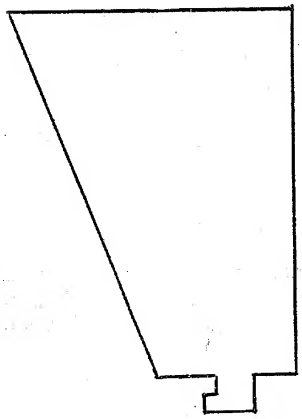
A rough die, and a precision die.



50X1-HUM

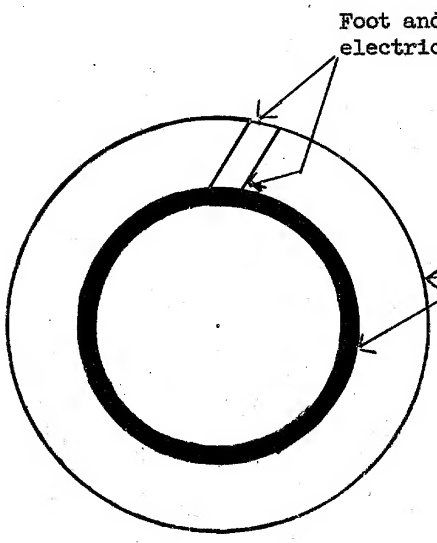
[redacted] sketch of die used for manufacture of stator blades - O22 turbine. Dimensions unknown.

Fig. 3



[redacted] rough sketch of stator blade for 022 type engine. (Dimensions unknown) 50X1-HUM

Fig. 4



[redacted] rough sketch of stator blade holding rings. (Dimensions unknown; method of securing rings unknown.) 50X1-HUM